FAHCE STEVENS CREEK FISH PASSAGE ENHANCEMENT

Project No. 00294001

PROBLEM DEFINITION/REFINED OBJECTIVES REPORT

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Capital Program Services Division

June 2009

Existing Denil Fish Ladder at **Fremont Avenue**

Existing Denil Fish Ladder at **Evelyn Avenue**

Existing Denil Fish Ladder at **Moffett Boulevard**

Proposed Multi-Port Outlet at **Stevens Creek Dam**

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INTRODUCTION, BACKGROUND AND PROBLEM DEFINITION (GENERAL)

Project Background

The problem of land development and water supply operations causing insufficient freshwater habitat for fish is widespread. The common problems for fish in Santa Clara County's watersheds are barriers to fish migration; warm stream temperatures; and reduced or fluctuating streamflows due to reservoir operations.

The local creeks and rivers also have been affected by a century of land development and water facility construction. Intense winter storms may occasionally fill or even flood the country's rivers and creeks, but generally it is the controlled releases of water from reservoirs—along with subsequent usage of that water—that determines streamflow levels. Water District operations direct a large portion of streamflow to treatment plants or into groundwater recharge ponds. Although mandated by the State Water Resources Control Board, water appropriations for continued protection of fisheries are limited—in balance with other public interests in the water resource. Biotic conservation interests include management of other aquatic and semi-aquatic species such as turtles and frogs.

Under the District's Fish and Aquatic Habitat Collaborative Effort (FAHCE), Stevens Creek has been identified as one of prime steelhead habitat within the county. Improving fish passage within the Stevens Creek corridor will promote and enhance the existence of steelhead and other salmonid species.

The existing Denil-type fish ladders at Fremont Avenue, Evelyn Avenue, and Moffett Boulevard are located in sections of Stevens Creek where summer flows are very limited. In most cases, there may be no flows at all.

In the past, the California Department of Fish and Game (CDFG) approved the design and installation of various Denil-type fish ladders throughout the state. However, based on current standards, CDFG does not consider Denil-type fish ladders as effective passage for migrating fish, and at times, considers these particular fish ladders as partial barriers. Denil-type fish ladders tend to accumulate debris and require frequent maintenance to prevent such accumulations.

Limited summer flows are due primarily to the limited flow releases from Stevens Creek Reservoir. Current flow releases from Stevens Creek Dam do not follow a sufficient cold water management plan to continually support fish habitat. The limnological aspects of the reservoir are such that availability of water resources for fishery resources is limited and merits adjustments for improved performance and better optimization, to allow for a wider suite of water management objectives.

Figure 1 shows the location of the four sites of concern.

Purpose

The purpose of this Problem Definition Report is to evaluate the existing fish passage problems at each of the four sites, determine the “cause root” of the problems, and develop sound objectives to fully address or minimize the problems. Based on the determined objectives, development of pertinent conceptual alternatives will be developed for each site, which will be covered in the Project Alternatives Report.

Original Project Objectives

During the initial phase of the planning process, the main project objectives were developed and are described below. In addition to adhering to these objectives, each site will have its own specific objectives for facility improvement. The specific objectives for each site do not contradict, but reaffirm these main objectives.

- Meet the District’s mitigation obligation resulting from the FAHCE settlement.
- Contribute to restoration and maintenance of a healthy steelhead trout population in the Stevens Creek watershed.
- Provide for suitable spawning and rearing habitat below Stevens Creek Dam within a cold water management zone, determined on an annual basis, through the development of an operations plan.
- Provide adequate passage for a broad range of organisms, which are covered under the Federal Endangered Species Act and under the Natural Communities Conservation Plan. This list would include adult steelhead trout to reach suitable spawning and rearing habitat and for out-migration of juveniles.
- Implement fish passage designs that do not adversely affect the flood protection capacity of the existing channel.

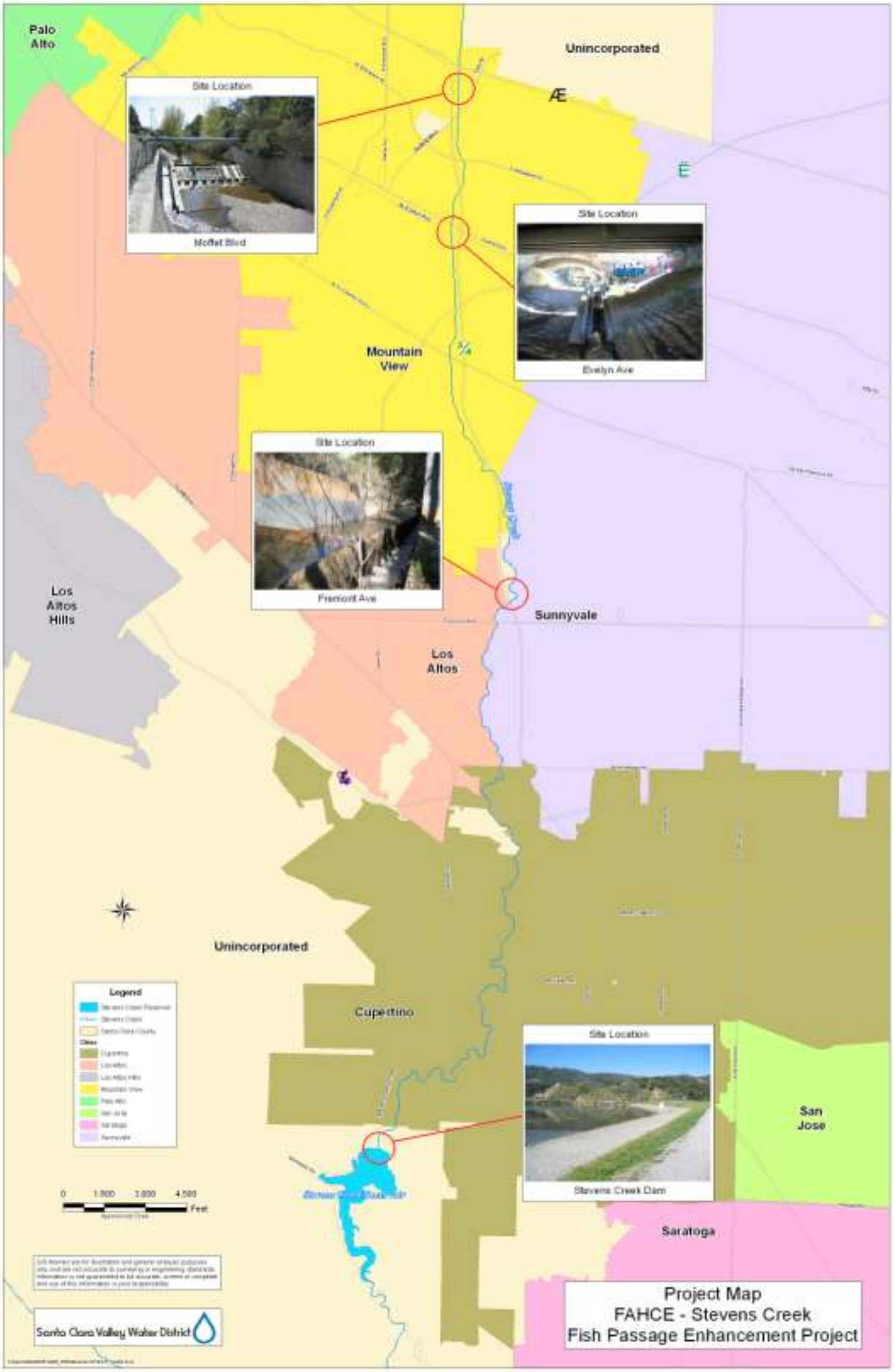


Figure 1. Location Map

FREMONT AVENUE

Identified Fish Passage Problems

The existing fish ladder for this site is located in the inside portion of a bend, where upstream of the bend, sediments would normally accumulate—thus, partially blocking the entrance/exit at the top of the fish ladder (see Figure 2). The Denil-type fish ladder for this section is obsolete based on current fish passage standards. Denil-type fish ladders are now considered by the CDFG and National Marine Fisheries Service (NMFS) to be partial barriers, due to the fact that blockage can and does occur within and above the steel weir structures of the fish ladder, rendering the ladder impassable. When blockage for this area occurs, there is no adequate operational access to remove the blockage (see Figure 3). In addition to the obsolete Denil-type fish ladder, there are other identified fish passage problems at this site:

- Immediately downstream and westerly of the concrete drop structure, the existing channel has been undermined, possibly due to excessive stream velocities (see Figure 4). The length of undermining is approximately 30 feet. The existing slope protection boulders within the vicinity of the undermined area have been carried downstream by high flows, and portions of the existing channel bottom are exposed down to 4 to 5 feet deep.
- The existing drop structure, which is a hardscape element that was built in the early 1980s, is considered an eyesore by most resource agencies. Although its fundamental function fully serves its hydraulic purpose, its hardscape elements do not conform to the natural landscape of the river corridor.
- There is no evident low-flow, thalweg-type corridor for fish passage downstream of the structure.

Project Objectives

The original project objectives as described on page 2 still apply for this fish passage improvement location.

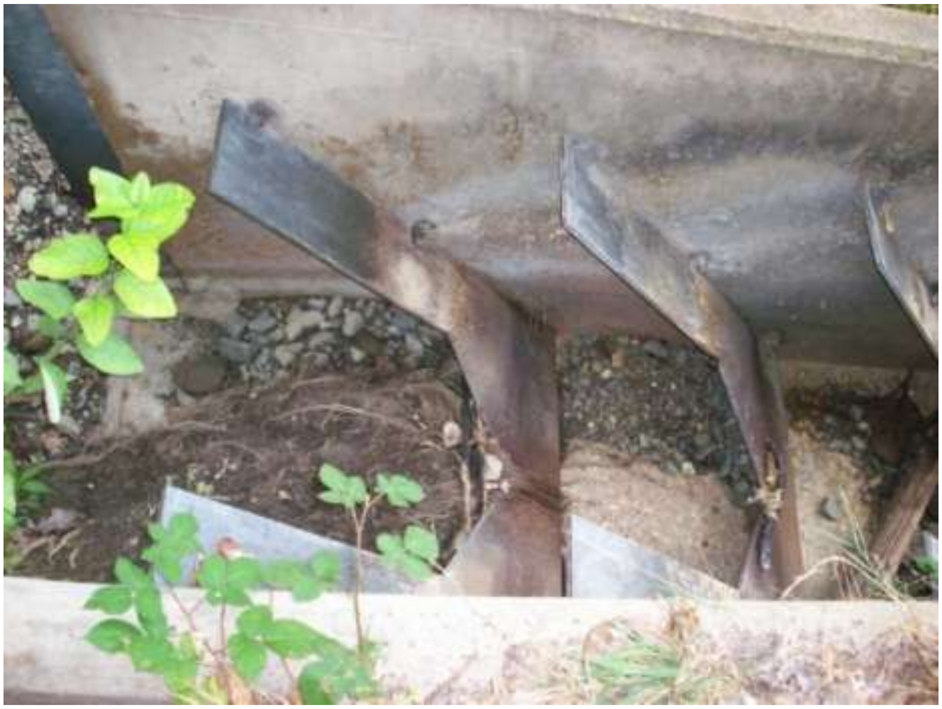


Figure 2. Fremont Avenue Fish Ladder (Top of Denil Structure)

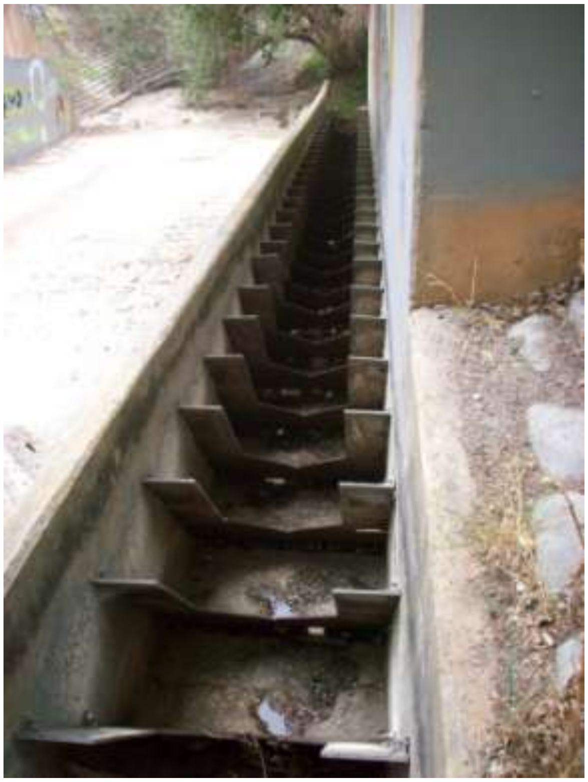


Figure 3. Fremont Avenue Fish Ladder (Looking Downstream at Denil Structure)
Site access to remove blockage is difficult during winter, high flow conditions.

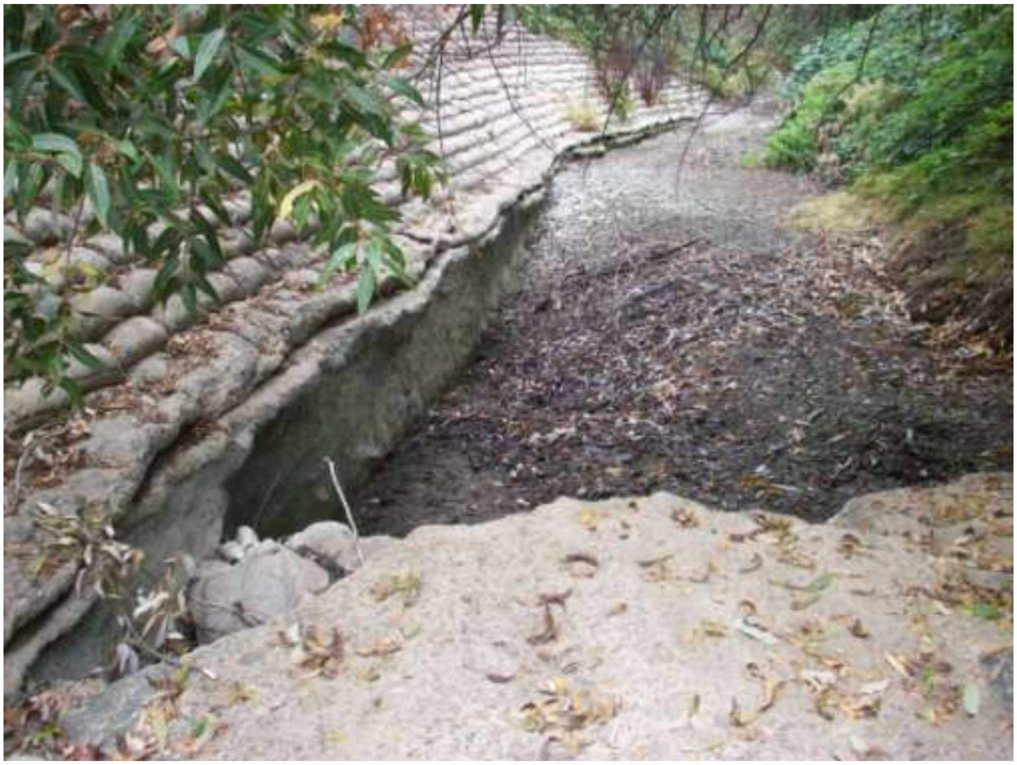


Figure 4. Fremont Avenue Fish Ladder (Downstream of Drop Structure)

EVELYN AVENUE

Identified Fish Passage Problems

This particular location also has a Denil-type fish ladder immediately downstream and westerly of the Union Pacific Railroad crossing (see Figure 5). Other fish passage problems identified at this site include:

- A concrete box culvert, which was constructed in the early 1980s, crosses below Evelyn Avenue, the Union Pacific Railroad, the VTA tracks, and Central Expressway (see Figures 6 to 8). The upstream end of the box culvert was previously designed such that the low flows would follow the path of the natural channel—the original concrete invert entrance of the box culvert was designed to be 2 feet above the natural invert of the natural channel. However, instead of the box culvert acting as a secondary route for higher flows, it is now acting as the primary route for low flows, with the main creek as a secondary route.
- An existing obsolete gaging weir just upstream of the UPRR crossing is probably causing a minor impediment to fish passage (see Figure 9).
- The arch foundation below the Union Pacific Railroad tracks is designed to fully support the railway system (see Figure 5). The flow elevation and height of this foundation system is such that it is causing an impediment to fish passage. Requesting UPRR to significantly modify their foundation would be difficult and may significantly be impossible.
- The pool immediately downstream of the Denil-type fish ladder naturally accumulates with sediments. Its primary function as a fish attractant pool is not realized (see Figure 10).
- The placement of concrete slabs and rocks downstream of the intended fish-attractant pool results in a poorly-defined low-flow channel (see Figure 11).

Project Objectives

The original project objectives as described on page 2 still apply for this fish passage improvement location.

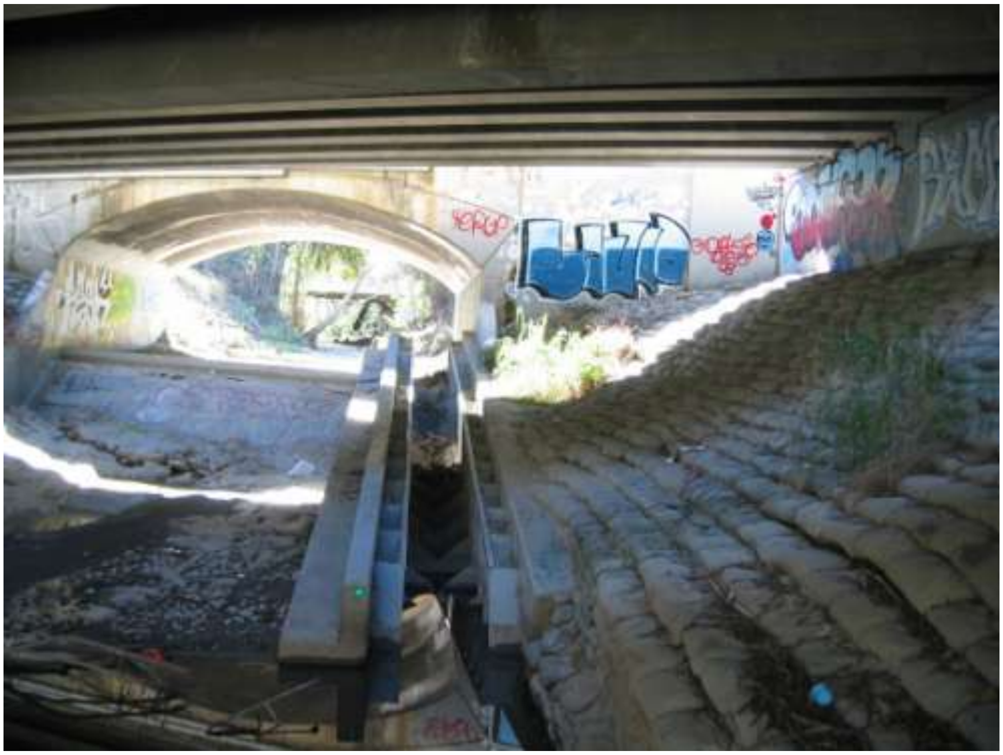
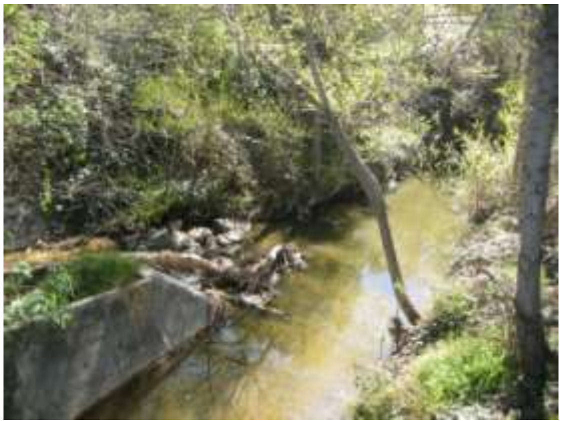


Figure 5. Evelyn Avenue Fish Ladder (Denil Structure Downstream of UPRR Crossing)



Figures 6, 7, and 8. Evelyn Avenue Fish Ladder
(Looking U/S, inside, and D/S of Box Culvert, Respectively)

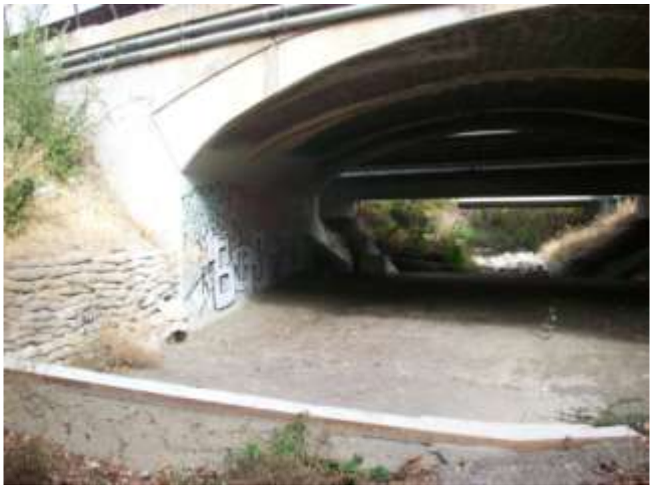


Figure 9. Evelyn Avenue Fish Ladder (Looking D/S at Obsolete Gaging Weir)

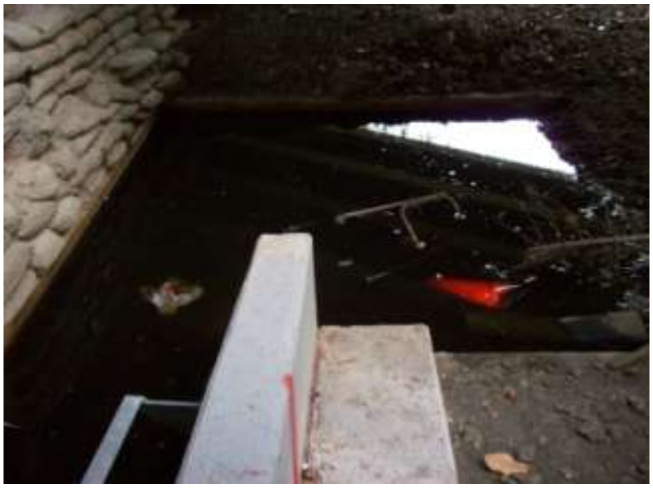


Figure 10. Evelyn Avenue Fish Ladder (Looking at Fish Attractant Pool)

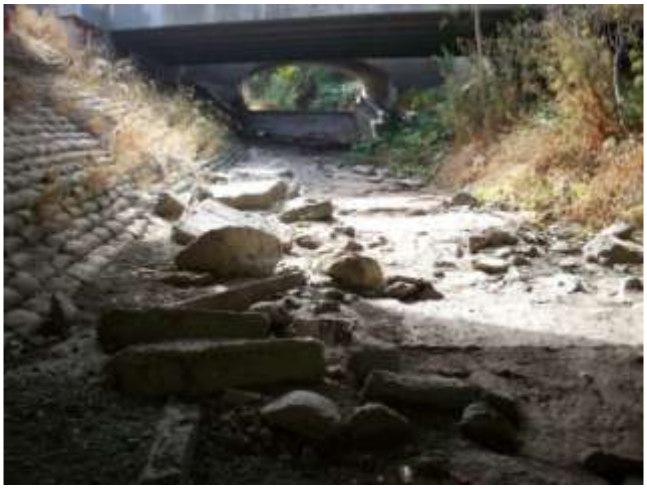


Figure 11. Evelyn Avenue Fish Ladder
(Looking at Concrete Slabs and Rocks Downstream)

MOFFETT BOULEVARD

Identified Fish Passage Problems

The drop structure between Highway 101 and Moffett Boulevard also has a Denil-type fish ladder on the easterly side of the drop structure (see Figure 12). Other fish passage problems identified at this site include:

- The existing drop structure, which is a hardscape element that was built in the early 1980s, is considered an eyesore by most resource agencies. Although its fundamental function fully serves its hydraulic purpose, its hardscape elements do not conform to the natural landscape of the river corridor.
- The pool immediately downstream of the Denil-type fish ladder naturally accumulates with sediments (see Figure 12). Its primary function as a fish attractant pool is not realized.
- The existing concrete-lined channel extending from immediately downstream of the drop structure to Highway 101 (a distance of 450 feet) is flat (see Figure 12). Low flows emanating from the drop structure will flow as a thin sheet of water over the concrete bottom. At least 6-inch depth of flow is required for adequate fish passage.

Project Objectives

The original project objectives as described on page 2 still apply for this fish passage improvement location.

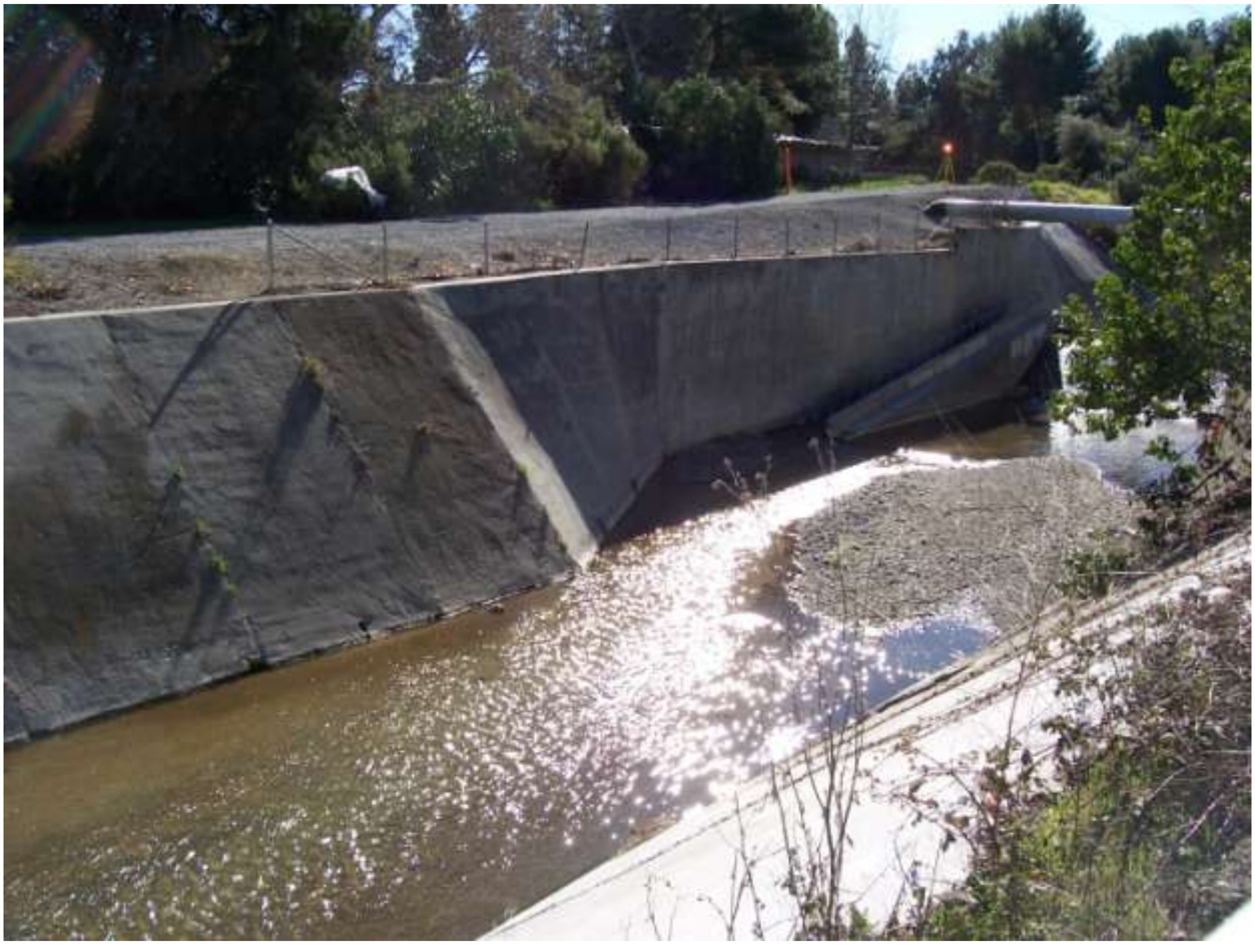


Figure 12. Moffett Boulevard Fish Ladder (Looking Southeasterly)

STEVENS CREEK RESERVOIR MULTI-PORT OUTLET STRUCTURE

Background

Stevens Creek Reservoir operations include release of water for groundwater recharge within the Stevens Creek stream bed. During warmer months, the reservoir thermally stratifies, with the bottom hypolimnion layer overlain by the warm epilimnion layer. This stratified condition is typically initiated in April, and extends until fall, when turnover and mixing occur with the onset of cooler water and reduced insulation. Complex interactions of energy input from sunlight, the balance of inflow and outflow, mixing by wind across the reservoir fetch, and internal turbidity conditions from phyto- and zooplankton blooms, suspended sediment, and other factors drive the extent of the stratification each year. The stream temperature downstream is reflected by this stratification. The outlet at the bottom of the reservoir releases cold water until the hypolimnion layer is exhausted. The warmer, upper epilimnion layer is then drained through the outlet, and the stream below the reservoir can warm rapidly, thus endangering the fishery and other wildlife habitat.

Identified Fish Passage Problems

The Fisheries and Aquatic Habitat Collaborative Effort Technical Advisory Committee (FAHCE-TAC) identified a limited opportunity for summer temperature management downstream of the reservoir, based on the relatively small storage capacity of the reservoir and the thermal stratification of this facility. With a single outlet at the bottom of the reservoir, the amount of available water to manage stream temperature downstream of the dam, to provide cooler habitat for cold-water fish such as steelhead trout, is limited. The in-stream recharges, as well as, fish habitat management, rely solely on this limited water source during summer months. This limited water source may only be up to half of the total storage volume of the reservoir. The total volume of the reservoir is not fully utilized for both these water management objectives.

The regulatory agencies, being concerned with conservation of steelhead trout (which is a species listed as “Threatened” under the Federal Species Act), restrict water release from the reservoir under a cold water scenario. Volume releases from the reservoir could be optimized if warm water was also released, subsequent to the exhaustion of the cold water. However, warm water releases would create undue physiological stress on the cold water fish in the system.

Project Objectives

The original project objectives as described on page 2 still apply for this location.

STAKEHOLDER OUTREACH

On April 27, 2009, we conducted an initial stakeholder meeting to discuss the problem definition and to obtain feedback from the stakeholders. The stakeholders' major concerns and feedback are described below:

1. Mr. Mondy Lariz of the Stevens and Permanente Creeks Watershed Council requests the water district to consider other fish barriers along Stevens Creek where the water district currently has access rights.

2. Pertinent to the drop structure at Moffett Boulevard, the concrete trapezoidal channel extends from downstream of Highway 101 up to the drop structure (a distance of approximately 500 feet). Addressing only the fish barrier at the drop structure would not address the overall fish passage conditions from downstream of Highway 101 to the drop structure.

3. Mr. Lariz considers the development of a multi-port structure upstream of the reservoir secondary to the removal of sediments from the reservoir. Although NMFS is advocating for a cold water management concept, Mr. Lariz believes water temperature is not critical to a healthy fish habitat. Mr. Lariz believes that thermal mixing of the reservoir water to increase discharge flow volume is unnecessary, and that available storage could be released unmixed to the stream below the reservoir. Instead of utilizing water district funds for the development of a multi-port outlet structure, Mr. Lariz recommends the water district consider harvesting gravel from the reservoir to augment the limited gravel supply downstream.

The stakeholders' input will be taken into consideration during the development of the project alternatives.

NEXT STEPS

There are four sites of concern—three existing fish ladders sites with partial barriers and the limited flow volume release during summer and warmer conditions from Stevens Creek Reservoir.

Although none of the sites poses a complete barrier or impedance to fish migration, the objective for each site is the improvement of fish passage and consequently the complete removal of any fish barrier. These objectives will be undertaken with regards to considering and not degrading the migration of other wildlife species.

The problems and objectives associated with the above structures will serve as basis for development of the project alternatives, and eventually, the staff-recommended project(s).

REFERENCES

Bates, Ken. Washington Department of Fish and Wildlife, 1992. *Fishway Design Guidelines for Pacific Salmon*.

California Department of Fish and Game, 1998. *California Salmonid Stream Habitat Restoration Manual,* Part VII.

Santa Clara Valley Water District

MEMORANDUM

TO:	Jim Fiedler, COO, Water Utility Enterprise Frank Maitski, DOO, Water Utility Technical Support Division Joan Maher, DOO, Water Supply Division	**FROM:**	David Salsbery, Fisheries Biologist Environmental Services Unit
SUBJECT:	TCHCP Steelhead Barrier Removal Proposal – Guadalupe River , Coyote and Stevens Creeks Watersheds	**DATE:**	September 24, 2012

BACKGROUND

Fish passage remediation for steelhead is a proposed mitigation measure in the Three Creeks Habitat Conservation Plan (TCHCP). Many fish passage barriers have been and continue to be remediated under existing District programs (e.g., Stream Maintenance Program) and addressed by District flood protection projects. The District has also remediated fish passage barriers at specifically targeted locations, such as the Alamitos Drop Structure. Some minor fish passage barriers have been identified and may remain downstream of District reservoirs, but do afford seasonal fish passage given adequate flow conditions.

ISSUE

Some temporal passage barriers may exist at certain times of the year due to natural low flow conditions and sediment deposition, as well as manmade conditions (i.e., debris in low flow channel). However, most major fish passage barriers have been remediated.

In discussions with internal and external stakeholders and through development of the TCHCP, staff believe conservation measures should include some additional barrier removal where feasible. However, not all remaining barriers are under District purview. In either case, staff has made a determination of barriers to be considered for inclusion in the TCHCP.

ANALYSIS

Guadalupe River Watershed:

Major fish passage impediments have been adequately remediated in the Guadalupe Watershed below the base of Guadalupe, Almaden, and Calero dams. This is evidenced by past biotelemetry studies that demonstrate fish passage in the Guadalupe River, even under a variety of flows and less-than-ideal fish passage conditions. At points in the stream that do not meet published fish passage criterion (such as jump pool to jump height ratios), fish can successfully migrate with relative ease.

Coyote Creek Watershed:

Most major fish impediments have been adequately remediated in Coyote Creek and Upper Penitencia Creek. The remaining major barrier is the Singleton Road crossing on the main stem of Coyote Creek and is a total barrier to upstream migration of adult steelhead (Attachment 1). However, the City of San Jose owns the site and the District does not have easement at this location.

Stevens Creek Watershed:

Most major fish passage impediments have been addressed in Stevens Creek below the base of the dam. The most significant barrier remaining on Stevens Creek below the dam is the concrete trapezoidal channel below the Moffett Boulevard fish ladder (Attachment 1). The concrete apron extends approximately 650 feet downstream of Highway 101. Migrating adult and, to a lesser extent, juvenile steelhead may be able to pass this reach of stream during narrow seasonal windows of opportunity. Passage is afforded when stream depth is adequate and velocities do not exceed the fish's ability to swim with or against relatively high velocities for prolonged distances. The existing fish ladder is not ideal. However, if maintained and under optimum flow conditions, it affords adequate fish passage. This fish ladder and reach of stream has been identified as a capital improvement project.

Of note, two other fish ladder facilities located upstream of Moffett at Evelyn Avenue and Fremont Avenue have also been identified as capital improvement projects sites. The fish ladder at Evelyn does not optimally perform due to the adjacent box culvert that tends to divert water away from the ladder. However, if the low flow channel upstream of the fish ladder and box culvert is maintained, and the ladder is clear of sediment and debris, fish passage is afforded.

Fish ladder operations at Fremont Avenue are compromised as it was built on the inside of the stream channel bend. The inside location causes debris and sediment deposition to occur at the top and within the ladder which can block fish passage. When maintained, the Fremont Avenue fish ladder affords fish passage.

Consequently, even while conditions at the Evelyn and Fremont ladders are not ideal, these facilities provide adequate fish passage when the sites are maintained and are not recommended for remediation at this time. All fish ladders in Santa Clara County operated by the District are on the annual Stream Maintenance Program inspection and service list.

RECOMMENDATION

To address stakeholder concerns for providing benefit to steelhead and to address impacts on District covered activities, remediation of two fish passage barriers are requested for inclusion in the TCHCP Conservation Program as follows: the Singleton Road crossing on Coyote Creek; and the concrete trapezoidal channel below the Moffett Boulevard fish ladder on Stevens Creek.

If you concur with this recommendation, please sign below:

Joan Maher 10/3/12

Joan Maher
Deputy Operating Officer, Water Supply Division

10/2/12

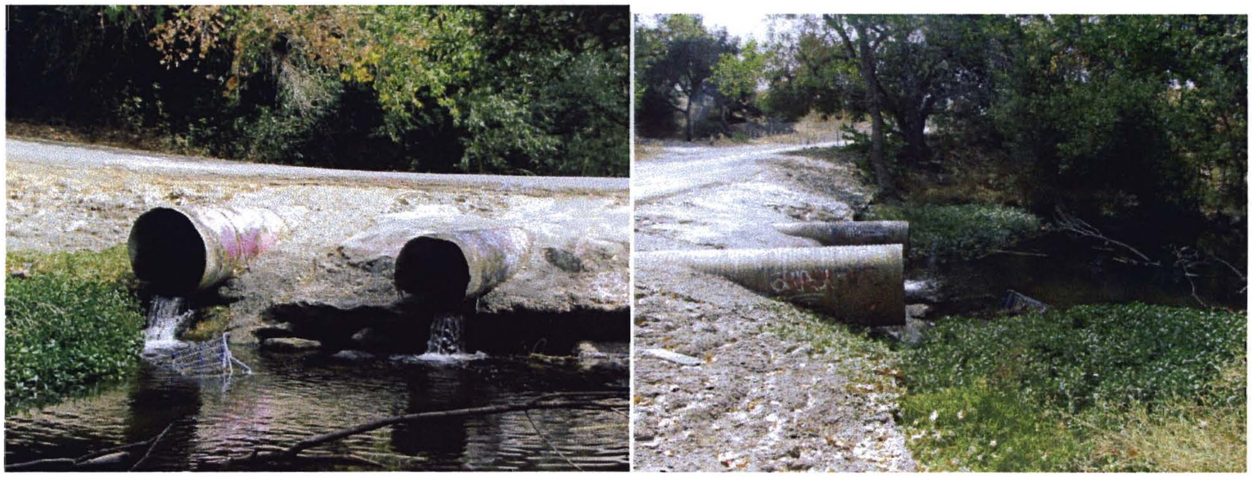
Frank Maitski
Deputy Operating Officer, Water Utility Technical Support Division

10/9/12

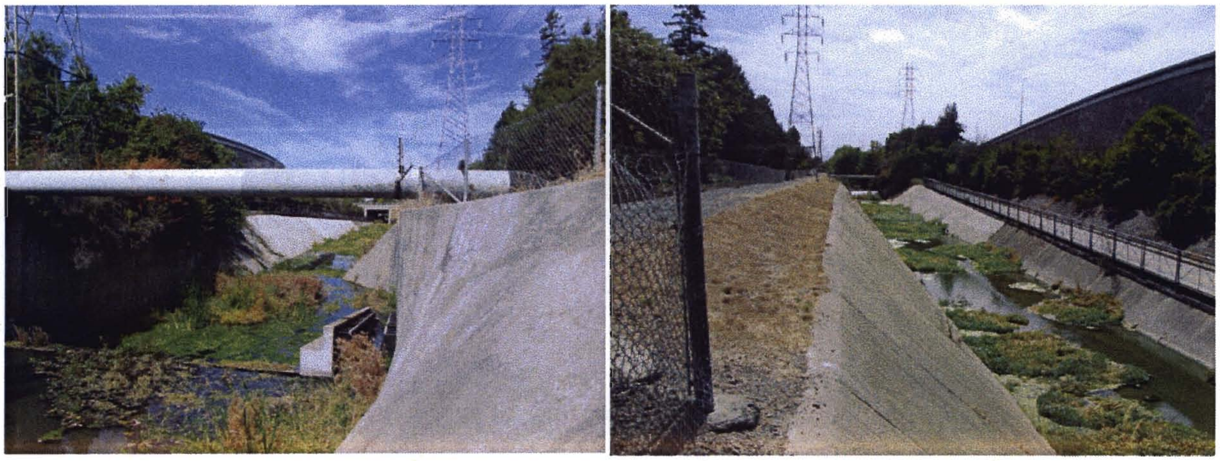
James M. Fiedler
Chief Operating Officer, Water Utility Enterprise

cc: D. Caldon; B. Dyer; M. Moore; Project files

Attachment 1



Coyote Creek at Singleton Road



Stevens Creek at Moffett Boulevard